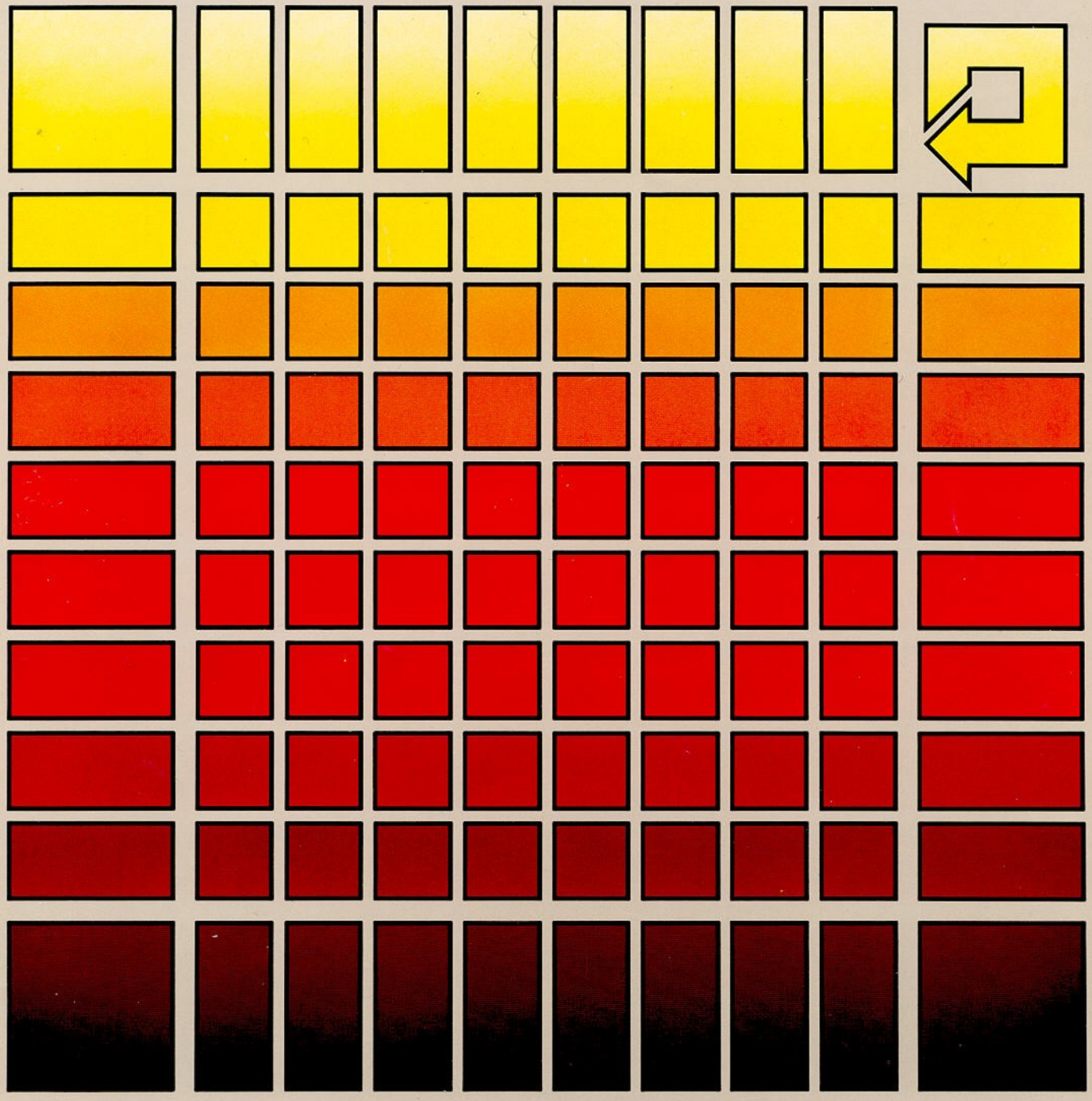
HEWLETT-PACKARD

HP 82163

Video Interface

OWNER'S MANUAL



HEWLETT PACKARD

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Owner's Manual

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82163A VIDEO INTERFACE
HEWLETT-PACKARD
TV
MONITOR

Introduction

The HP 82163 Video Interface provides video display capabilities for your calculator or computer system through the Hewlett-Packard Interface Loop (HP-IL). This manual describes the operation of all versions of the HP 82163. These versions—which are identified by the suffix to the model number—differ according to the antenna connector and TV channel used in the country where the unit is sold.*

The video interface is typically controlled by your calculator or computer through its HP-IL capabilities or HP-IL extensions. Therefore, you should refer to the owner's manual for your computer, calculator, or HP-IL extension for operating information.

Your HP 82163 Video Interface is packaged with the following accessories:

- One HP-IL cable.
- One ac adapter.
- One TV/monitor cable.
- One switch box (inside the U.S.A.) or one cable adapter (outside the U.S.A.).†

Optional accessories and specifications are listed in appendix B.

Installation

Your HP 82163 Video Interface is ready to use with your system after connecting power to it, joining it with an HP-IL system and connecting it to a TV or monitor.

Power

Power for the HP 82163 Video Interface is provided by the ac adapter. To connect it to the interface, first plug it into an ac outlet, then insert the adapter plug into the power receptacle at the rear of the interface.

HP-IL Connections

The Hewlett-Packard Interface Loop can consist of several peripheral devices and a controller (calculator or computer). The devices may be connected in any order—but all of the interface cables must form a continuous loop. All connections are designed to ensure proper orientation.

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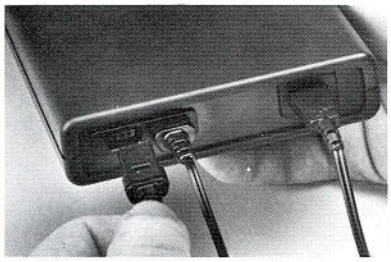
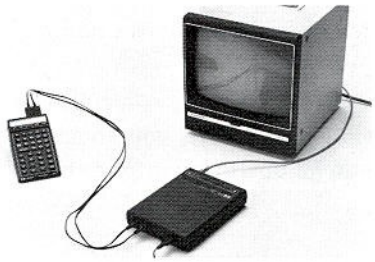
*This manual specifies the TV channel used by the HP 82163A, which is the version designed for operation in the U.S.A. The addendum card included with other versions specifies the TV channel used by those versions.

†The switch box and cable adapter are used to connect the video interface to a TV. However, a TV can't be used with the video interface in certain countries; therefore, in those countries, a switch box or cable adapter is not included. (Refer to the addendum card supplied with your unit to determine if you cannot use a TV.)

To connect the HP 82163 Video Interface to the loop, first turn off the controller. Then, simply disconnect the loop in one place and connect the video interface in that place. (In some situations the video interface might be the only peripheral in the loop.)





Note: The system's operation may be disrupted when the loop is disconnected.

Monitor Connections

To connect the HP 82163 Video Interface to a monitor, insert one end of the TV/monitor cable into the MONITOR jack on the video interface and the other end into the input jack on the monitor.

Note: Some monitors may require special adapters. Refer to the specifications for your monitor to determine what type of adapter, if any, may be needed.

Television Connections

Inside the U.S.A. To connect the interface to a television set, first connect the switch box to the TV, then connect the video interface to the switch box. The switch box allows you to have the video interface and the VHF antenna connected to the TV at the same time so that you can simply switch between viewing normal programs and using the interface.

To connect the switch box to the TV, disconnect the VHF antenna wires from the VHF screws on the TV, then attach the antenna wires from the video interface to the screws. If you want to connect the VHF antenna to the switch box, loosen the screws through the access hole on the end of the switch box, insert the wires from the VHF antenna through the slot on the underside of the switch box, slide the wires under the screw heads, and tighten the screws.

---

* Certain video monitors can be connected in a series to receive the same signal from the video interface. For more information, refer to your monitor owner's manual.

To connect the interface to the switch box, plug the end of the TV/monitor cable into the TV jack on the video interface, then insert the other end into the phono jack on the switch box.

When using the video interface, the switch on the switch box should be set to INTERFACE. When viewing normal television programs, the switch should be set to TV.

Outside the U.S.A. To connect the video interface to a television, first insert the TV/monitor cable into the TV jack on the video interface, then attach the cable adapter to the other end of the cable. Plug the adapter end into the input jack on the TV. (Other special adapters may be required in certain countries.)

> Note: The HP 82163A Video Interface is sold in countries that use the same television standard as the U.S.A. If you have the HP 82163A, you should follow the instructions under Inside the U.S.A.

Television Tuning

Inside the U.S.A. When using a television with the interface, it must be tuned to channel 3.

Outside the U.S.A. The TV channel used by the interface depends upon the country in which it is sold. Refer to the addendum card included with your unit to determine which channel to use.

Operation

The video interface is ready to use when it has been connected to a power source, connected to a TV or monitor,* and connected to a Hewlett-Packard Interface Loop. It will then accept HP-IL messages and respond to many of the print commands issued by your calculator or computer through its HP-IL capabilities or extensions. More specifically, it displays data bytes sent to it, except for those contained in recognized escape sequences. (Escape sequences are described on page 9.) Appendix A describes how to verify proper operation.

Technical Description

The previous sections explained the basic operation of the HP 82163 Video Interface. This section discusses some of the more detailed aspects of operating the interface.

Throughout this section, the term "display" refers to the screen of the TV or monitor to which the interface is connected. It also refers to the operation of printing data on the display.

Internal Design

Character set. The HP 82163 Video Interface features 95 displayable characters and 4 nondisplayable control characters, each with a corresponding code number shown in the table below.

---

* The interface will function normally without actually being connected to a TV or monitor.

HP 82163 Video Interface Character Set

CODE NUMBER	CHARACTER	CODE NUMBER	CHARACTER	CODE NUMBER	CHARACTER	CODE NUMBER	CHARACTER
0		32	(Space)	64	@	96	`
1		33	!	65	A	97	a
2		34	"	66	B	98	b
3		35	#	67	C	99	c
4		36	$	68	D	100	d
5		37	%	69	E	101	e
6		38	&	70	F	102	f
7		39	'	71	G	103	g
8	(BS)	40	(	72	H	104	h
9		41	)	73	I	105	i
10	(LF)	42	*	74	J	106	j
11		43	+	75	K	107	k
12		44	,	76	L	108	l
13	(CR)	45	−	77	M	109	m
14		46	.	78	N	110	n
15		47	/	79	O	111	o
16		48	0	80	P	112	p
17		49	1	81	Q	113	q
18		50	2	82	R	114	r
19		51	3	83	S	115	s
20		52	4	84	T	116	t
21		53	5	85	U	117	u
22		54	6	86	V	118	v
23		55	7	87	W	119	w
24		56	8	88	X	120	x
25		57	9	89	Y	121	y
26		58	:	90	Z	122	z
27	(E_C)	59	;	91	[	123	{
28		60	<	92	\	124	|
29		61	=	93	]	125	}
30		62	>	94	^	126	~
31		63	?	95	_	127	

Only characters 32 through 126 are displayable. They can be displayed in inverse video (black character on white background) by adding 128 to their code numbers. (This is equivalent to setting the most significant bit of a data byte to 1.)

A control character, when sent to the video interface, is not displayed, but is treated as a command. Characters zero through 31 in the character set table are control characters; however, only characters 8, 10, 13, and 27 are used by the interface. These code numbers correspond to the commands Back Space (BS), Line Feed (LF), Carriage Return (CR) and Escape (E_C). All other control codes received by the interface are ignored.

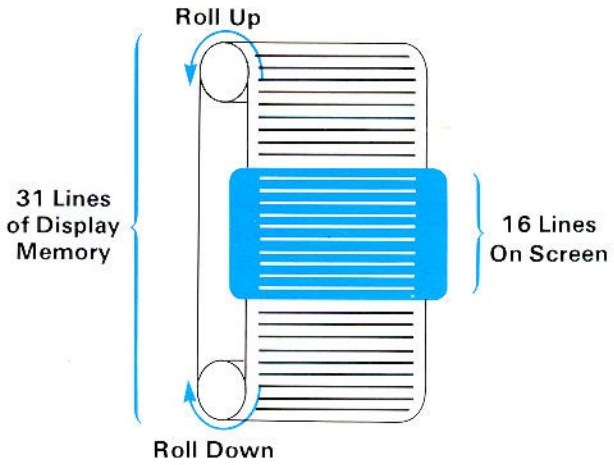
Carriage return is a function that moves the cursor to column zero. Line feed causes the cursor to move down one line, unless the cursor is at the bottom of the display; then the display will roll up one line and the top line of display memory will be lost.* Backspace causes the cursor to move one column to the left, unless the cursor is at column zero; then it will move to column 31 of the previous line. It will not backspace beyond column zero, row zero.

Display Memory. The display memory, consisting of 992 bytes, will hold 31 lines of up to 32 characters. However, at any one time the video interface displays up to 16 of these lines. The remaining lines may be displayed by scrolling them onto the screen.

Scrolling is the operation of rolling the screen up or down; often lines of text are rolled off the screen, though they are retained in the display memory.

*The interface automatically executes a CR and LF when a character is written into column 31. If an end-of-line indicator (CR, LF) is sent with the character, it is ignored by the interface so that a double LF does not occur.

The video interface features top-around scrolling. The first line of memory will follow the last line of memory onto the screen in a repeated roll-up operation. The last line will follow the first if a roll-down operation is continued.



Controlling the Video Interface

Most controllers perform a specified operation by automatically sending a preprogrammed sequence of HP-IL messages around the interface loop. You would not be using the actual HP-IL messages in this case, but rather you would be using the HP-IL capabilities built into your calculator, computer, or HP-IL extension. This section describes how the HP 82163 Video Interface responds to the *individual* HP-IL messages.

The video interface operates according to information it receives on the interface loop. Specifically, it responds to the standard HP-IL messages (listed on page 10), including special Data Byte messages (in the form of escape sequences, listed on page 10) that are interpreted as instructions.

Startup Conditions. The video interface is automatically turned on when the ac adapter is plugged into it. While the ac adapter is plugged in, the interface retains its display memory whether or not the TV or monitor is turned on or connected.

When the video interface is first connected to its power source and is linked with HP-IL, it is in an inactive mode and its default HP-IL address is set to 3. (In most applications this default address isn't used, since controllers usually assign addresses to loop devices.)

Escape Sequences. The HP 82163 Video Interface responds to 14 escape sequences. An escape sequence is a string of characters that is sent out on the loop as a series of Data Bytes and interpreted as a special instruction by the device receiving it. An escape sequence always starts with ^{E}c (escape)—code number 27— and is followed by one or more characters that define the instruction. Escape sequences are used by the video interface to position the cursor, scroll through display memory, and clear the display.

Many different escape sequences can be passed through HP-IL; however, the video interface responds to only a few of these. When the interface receives an escape sequence that it does not recognize, it displays all but the first two characters in the sequence. Escape sequences recognized by the interface are shown in the following table.

Escape Sequence Instructions

ESCAPE SEQUENCE	CHARACTER CODES	INSTRUCTION	DESCRIPTION
$^{E}_{C}$A	27 65	Cursor Up	Moves the cursor up one line; cursor does not move past top line.
$^{E}_{C}$B	27 66	Cursor Down	Moves cursor down one line; cursor does not move past bottom line.
$^{E}_{C}$C	27 67	Cursor Right	Moves cursor right one position; if activated at column 31, cursor moves to column 0 of the next line; if activated at column 31, row 15, cursor moves to column 0, row 0.
$^{E}_{C}$D	27 68	Cursor Left	Moves cursor left one position; if activated at column 0, moves cursor to column 31 of previous line; cursor doesn't move past column 0, row 0.
$^{E}_{C}$E	27 69	Clear Device	Clears the display memory, moves the cursor to home (column 0, row 0) and displays cursor as a blinking block.
$^{E}_{C}$H	27 72	Cursor Home	Moves the cursor to home (column 0, row 0) but does not affect the display.
$^{E}_{C}$J	27 74	Clear Display From Cursor	Clears the display from the cursor position to the bottom of the screen.
$^{E}_{C}$Q	27 81	Insert Cursor	Displays cursor as a blinking left arrow.
$^{E}_{C}$R	27 82	Replace Cursor	Displays cursor as a blinking block.
$^{E}_{C}$S	27 83	Roll Up	Rolls screen up one line.
$^{E}_{C}$T	27 84	Roll Down	Rolls screen down one line.
$^{E}_{C}$<	27 60	Cursor Off	Cursor is not displayed, but still functions normally.
$^{E}_{C}$>	27 62	Cursor On	Displays cursor.
$^{E}_{C}$% *x y*	27 37 *m n*	Cursor To Address	Moves cursor to a display address of the form (*m*, *n*) where *m* and *n* are code numbers for characters *x* and *y*. The column address is interpreted as (*m* modulo 32) and the row address as (*n* modulo 16).

HP-IL Messages. When the video interface receives an HP-IL message, it responds according to the following table. Except where noted, it automatically passes the command on to the next device in the loop.

Responses to HP-IL Messages

HP-IL MESSAGE	VIDEO INTERFACE RESPONSE
COMMAND GROUP	
Interface Clear	Removes talker or listener status.
Device Clear	Display memory is cleared; cursor set to row 0, column 0; replace cursor is displayed.
Selected Device Clear	If listener, device cleared as with Device Clear.
Go To Local	No response.
Local Lockout	No response.
Remote Enable	No response.
Not Remote Enable	No response.
Parallel Poll Enable 0-15	No response.
Parallel Poll Disable	No response.
Parallel Poll Unconfigure	No response.
Group Execute Trigger	No response.
Loop Power Down	No response.
Enable Asyncronous Requests	No response.
Auto Address Unconfigure	Address set to 31.
Listen Address 0-31	If address matches, device is removed from talker status and becomes a listener.
	If message address is 31, device removed from listener status.

Responses to HP-IL Messages (Continued)

HP-IL MESSAGE	VIDEO INTERFACE RESPONSE
Unlisten	Device is removed from listener status.
Device Dependent Listener 0-31	No response.
Talk Address 0-31	If address matches, device removed from listener status and becomes a talker.
	If address does not match, device removed from talker status.
Untalk	Device is removed from talker status.
Device Dependent Talker 0-31	No response.
Secondary Address 0-30	No response.
Null	No response.
READY GROUP	
Take Control	No response.
Ready For Command	Passes message to next device in the loop after responding to previous message.
Send Data	No response.
Send Status	No response.
Send Device ID	No response.
Send Accessory ID	If a talker, sends one byte with a value of 48.*
Not Ready For Data	If it receives this message after sending accessory ID, it sends an End of Transmission—Error message; otherwise, no response.
End of Transmission—OK	No response.
End of Transmission—Error	No response.
Auto Address 0-31	If device has earlier auto address, no response.
	If message address is 31, no response.
	If message address is less than 31 and device does not have earlier auto address, sets device address to message address, increments message address by one, and passes revised message to next device.
Auto Extended Primary 0-31	No response.
Auto Extended Secondary 0-31	No response.
Auto Multiple Primary 0-31	No response.
IDENTIFY GROUP	
Identify (no service request)	No response.
Identify (service request)	No response.
DATA GROUP	
Data Byte (no service request) Data Byte (service request)	If listener, accepts data byte and passes to next device.
End Byte (no service request) End Byte (service request)	If listener, accepts data byte and passes to next device.

*Indicates that the received message is not passed to the next device in the loop.

Appendix A

Care, Warranty, And Service Information

Care of the Video Interface

The HP 82163 Video Interface is designed to require very little maintenance. However, you should observe the temperature limits listed on page 18.

Verifying Proper Operation

If at any time you suspect that your video interface or the interface loop is not operating properly, you can verify its operation by doing the following:

1. Check that all peripheral devices are turned on.
2. Check that the calculator or computer and its HP-IL interface are working properly. Refer to the owner's manuals for those devices.
3. Check that the television or monitor is properly adjusted and that the television is tuned to the correct channel.
4. Check that all cables and antenna wires are properly connected.

If you still experience difficulty, write or telephone Hewlett-Packard at an address or phone number listed below under Service.

Limited One-Year Warranty

What We Will Do

The HP 82163 Video Interface is warranted by Hewlett-Packard against defects in materials and workmanship for one year from the date of original purchase. If you sell your unit or give it as a gift, the warranty is automatically transferred to the new owner and remains in effect for the original one-year period. During the warranty period, we will repair or, at our option, replace at no charge a product that proves to be defective, provided you return the product, shipping prepaid, to a Hewlett-Packard service center.

What Is Not Covered

This warranty does not apply if the product has been damaged by accident or misuse or as the result of service or modification by other than an authorized Hewlett-Packard service center.

No other express warranty is given. The repair or replacement of a product is your exclusive remedy. **ANY OTHER IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS IS LIMITED TO THE ONE-YEAR DURATION OF THIS WRITTEN WARRANTY.** Some states, provinces, or countries do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you. **IN NO EVENT SHALL HEWLETT-PACKARD COMPANY BE LIABLE FOR CONSEQUENTIAL DAMAGES.** Some states, provinces, or countries do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state, province to province, or country to country.

Warranty for Consumer Transactions in the United Kingdom

This warranty shall not apply to consumer transactions and shall not affect the statutory rights of a consumer. In relation to such transactions, the rights and obligations of Seller and Buyer shall be determined by statute.

Obligation to Make Changes

Products are sold on the basis of specifications applicable at the time of manufacture. Hewlett-Packard shall have no obligation to modify or update products once sold.

Warranty Information

If you have any questions concerning this warranty, please contact an authorized Hewlett-Packard dealer or a Hewlett-Packard sales and service office. Should you be unable to contact them, please contact:

- In the United States:

Hewlett-Packard
1000 N.E. Circle Blvd.
Corvallis, OR 97330
Telephone: (503) 758-1010
Toll-Free Number: (800) 547-3400 (except in
Oregon, Hawaii, and Alaska)

- In Europe:

Hewlett-Packard S.A.
7, rue du Bois-du-Lan
P.O. Box
CH-1217 Meyrin 2
Geneva
Switzerland
Telephone: (022) 83 81 11

Note: Do *not* send units to this address for repair.

- In other countries:

Hewlett-Packard Intercontinental
3495 Deer Creek Rd.
Palo Alto, California 94304
U.S.A.
Telephone: (415) 857-1501

Note: Do *not* send units to this address for repair.

Service

Hewlett-Packard maintains service centers in most major countries throughout the world. You may have your unit repaired at a Hewlett-Packard service center any time it needs service, whether the unit is under warranty or not. There is a charge for repairs after the one-year warranty period.

Hewlett-Packard products are normally repaired and reshipped within five (5) working days of receipt at any service center. This is an average time and could possibly vary depending upon the time of year and work load at the service center. The total time you are without your unit will depend largely on the shipping time.

Obtaining Repair Service in the United States

The Hewlett-Packard United States Service Center for the HP 82163 Video Interface is located in Corvallis, Oregon:

Hewlett-Packard Company
Corvallis Division Service Department
P.O. Box 999/1000 N.E. Circle Blvd.
Corvallis, Oregon 97330, U.S.A.
Telephone: (503) 757-2000

Obtaining Repair Service in Europe

Service centers are maintained at the following locations. For countries not listed, contact the dealer where you purchased your unit.

AUSTRIA
HEWLETT-PACKARD GmbH
Kleinrechner-Service
Wagramerstr.-Lieblgasse
A-1220 VIENNA
Telephone: (222) 23 65 11

BELGIUM
HEWLETT-PACKARD BELGIUM SA/NV
Boulevard de la Woluwe 100
Woluwelaan
B-1200 BRUSSELS
Telephone: (2) 762 32 00

DENMARK
HEWLETT-PACKARD A/S
Datavej 52
DK-34-60 BIRKEROD (Copenhagen)
Telephone: (02) 81 66 40

EASTERN EUROPE
Refer to the address listed under Austria

FINLAND
HEWLETT-PACKARD OY
Revontulentie 7
SF-02100 ESPOO 10 (Helsinki)
Telephone: (90) 455 02 11

FRANCE
HEWLETT-PACKARD FRANCE
Division Informatique Personnelle
S.A.V. Calculateurs de Poche
F-91947 Les Ulis Cedex
Telephone: (6) 907 78 25

GERMANY
HEWLETT-PACKARD GmbH
Kleinrechner-Service
Vertriebszentrale
Berner Strasse 117
Postfach 560 140
D-6000 FRANKFURT 56
Telephone: (611) 50041

ITALY
HEWLETT-PACKARD ITALIANA S.P.A.
Casella postale 3645 (Milano)
Via G. Di Vittorio, 9
I-20063 CERNUSCO SULNAVIGLIO (Milan)
Telephone: (2) 90 36 91

NETHERLANDS
HEWLETT-PACKARD NEDERLAND B.V.
Van Heuven Goedhartlaan 121
N-1181 KK AMSTELVEEN (Amsterdam)
P.O. Box 667
Telephone: (020) 472021

NORWAY
HEWLETT-PACKARD NORGE A/S
P.O. Box 34
Oesterndalen 18
N-1345 OESTERAAS (Oslo)
Telephone: (2) 17 11 80

SPAIN
HEWLETT-PACKARD ESPANOLA S.A.
Calle Jerez 3
E-MADRID 16
Telephone: (1) 458 2600

SWEDEN
HEWLETT-PACKARD SVERIGE AB
Enighetsvagen 3
Box 205 02
S 161 BROMMA 20 (Stockholm)
Telephone: (8) 730 05 50

SWITZERLAND
HEWLETT-PACKARD (SCHWEIZ) AG
Kleinrechner-Service
Allmend 2
CH-8967 WIDEN
Telephone: (057) 50111

UNITED KINGDOM
HEWLETT-PACKARD Ltd
King Street Lane
GB-WINNERSH, WOKINGHAM
BERKSHIRE RG11 5AR
Telephone: (734) 784774

International Service Information

Not all Hewlett-Packard service centers offer service for all models of HP products. However, if you bought your product from an authorized Hewlett-Packard dealer, you can be sure that service is available in the country where you bought it.

If you happen to be outside of the country where you bought your unit, you can contact the local Hewlett-Packard service center to see if service is available for it. If service is unavailable, please ship the unit to the address listed above under Obtaining Repair Service in the United States. A list of service centers for other countries can be obtained by writing to that address.

All shipping, reimportation arrangements, and customs costs are your responsibility.

Service Repair Charge

There is a standard repair charge for out-of-warranty repairs. The repair charges include all labor and materials. In the United States, the full charge is subject to the customer's local sales tax. In European countries, the full charge is subject to Value Added Tax (VAT) and similar taxes wherever applicable. All such taxes will appear as separate items on invoiced amounts.

Products damaged by accident or misuse are not covered by the fixed repair charges. In these situations, repair charges will be individually determined based on time and material.

Service Warranty

Any out-of-warranty repairs are warranted against defects in materials and workmanship for a period of 90 days from date of service.

Shipping Instructions

Should your unit require service, return it with the following items:

- A completed Service Card, including a description of the problem and system setup when the problem occurred.
- A sales receipt or other documentary proof of purchase date if the one-year warranty has not expired.

The product, the Service Card, a brief description of the problem and system configuration, and (if required) the proof of purchase date should be packaged in the original shipping case or other adequate protective packaging to prevent in-transit damage. Such damage is not covered by the one-year limited warranty; Hewlett-Packard suggests that you insure the shipment to the service center. The packaged unit should be shipped to the nearest Hewlett-Packard designated collection point or service center. Contact your dealer directly for assistance. (If you are not in the country where you originally purchased the unit, refer to International Service Information above.)

Whether the unit is under warranty or not, it is your responsibility to pay shipping charges for delivery to the Hewlett-Packard service center.

After warranty repairs are completed, the service center returns the unit with postage prepaid. On out-of-warranty repairs in the United States and some other countries, the unit is returned C.O.D. (covering shipping costs and the service charge).

Further Information

Service contracts are not available. Circuitry and designs are proprietary to Hewlett-Packard, and service manuals are not available to customers.

Should other problems or questions arise regarding repairs, please call your nearest Hewlett-Packard service center.

Potential for Radio/Television Interference (For U.S.A. Only)

The HP 82163 Video Interface generates and uses radio frequency energy and, if not installed and used properly (that is, in strict accordance with the instructions in this manual), may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class B TV interface device in accordance with the specifications in Subpart J of FCC rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If the interface does cause interference to radio or television reception, which can be determined by disconnecting then connecting the ac adapter to the interface, you are encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna.
- Relocate the interface with respect to the receiver.
- Move the interface away from the receiver.
- Plug the ac adapter into a different outlet so that the interface and the receiver are on different branch circuits.

If necessary, you should consult your dealer or an experienced radio/television technician for additional suggestions. You may find the following booklet, prepared by the Federal Communications Commission, helpful: *How to Identify and Resolve Radio-TV Interference Problems*. This booklet is available from the U.S. Government Printing Office, Washington, D.C. 20402, Stock Number 004-000-00345-4.

Applications Information

A number of our users submit program applications or unique programs to Hewlett-Packard. However, we can consider using only ideas given freely to us. Since it is the policy of Hewlett-Packard not to accept suggestions given in confidence, the following statement must be included with your submittal:

"I am voluntarily submitting this information to Hewlett-Packard Company. The information is not confidential and Hewlett-Packard may do whatever it wishes with the information without obligation to me or anyone else."

Dealer and Product Information

For dealer locations, product information, and prices, please call (800) 547-3400. In Oregon, Alaska, and Hawaii, call (503) 758-1010.

Accessories and Specifications

Accessories

The following optional accessories are available for the HP 82163 Video Interface:

HP-IL Cables in the following lengths:

½ meter (1½ feet)	HP 82167A
1 meter (3 feet)	HP 82167B
5 meters (16 feet)	HP 82167D*

Specifications

The following specifications apply to the HP 82163 Video Interface:

Display Characteristics

- Line length: 32 standard characters.
- Number of lines displayed: 16.
- Display memory: 31 lines (992 one-byte cells).
- Character set: 95 display characters and 4 control characters.

Interface

- Type: HP-IL (Hewlett—Packard Interface Loop).
- Startup conditions: inactive.
- Default address: 3.

Power Requirements

- Primary source: ac adapter.
- Usage: 3 watts.

Temperature Limits

- Operating: 0° to 55° C (32° to 131° F).
- Storage: −40° to 75° C (−40° to 167° F).

Signal Characteristics

	HP 82163A	HP 82163B
• Frequency:	61.25 MHz	62.25 MHz
• Screen density:	525 lines	625 lines
• Refresh rate:	60 Hz	50 Hz
• Output impedance (monitor and TV):	75 ohms	75 ohms

* Not available in all countries.

Using the HP-41 As a Controller

Introduction

All of the functions of the HP 82163 Video Interface are available to the HP-41 user through the HP 82160A HP-IL Module. You can create inverse video characters and generate all of the escape sequences that the video interface responds to.

In this section, the HP-41 functions that are on the standard keyboard are shown as single black keys, such as [CLx]. Other functions are represented as single blue keys, such as [ADV] and [OUTA].

The Video Interface and HP-IL Module Functions

The following functions are useful for sending information and instructions to the video interface.

FUNCTION	VIDEO INTERFACE RESPONSE
[ACA]	Displays contents of ALPHA register. No end-of-line indicator is received.
[ACCHR]	Immediately displays the specified character. No end-of-line indicator is received. If a control character is specified, then the interface responds to that instruction.
[ACSPEC]	Displays a special character built from a character code with
[ADV]	Receives an end-of-line indicator.
[ACX]	Displays contents of X-register. No end-of-line indicator is received.
[BLDSPEC]	Builds a special character from a character code in the X-register.
[LIST]	Displays specified program lines.
[OUTA]	Displays contents of ALPHA register. An end-of-line indicator is received, unless flag 17 is set. If control codes or escape sequences are in the ALPHA register, then the interface responds to those instructions.
[PRA]	Displays the contents of the ALPHA register; an end-of-line indicator is received.
[PRBUF]	An end-of-line indicator is received.
[PRFLAGS]	Displays flag status listing.
[PRKEYS]	Displays listing of current key assignments.
[PRP]	Displays the specified program listing.
[PRREG]	Displays the contents of the storage registers.
[PRREGX]	Displays the contents of the storage registers as specified in the X-register.
[PRΣ]	Displays the contents of the statistical registers.
[PRSTK]	Displays the contents of the X-, Y-, Z- and T- registers.
[PRX]	Displays the contents of the X-register. An end-of-line indicator is received.

The end-of-line indicator for the HP-41 is Carriage Return (CR), Linefeed (LF)—character codes 13 and 10. Flag 17 controls how the video interface receives end-of-line indicators. If flag 17 is clear, Data Byte sequences sent to the interface with [OUTA] contain an end-of-line indicator. If flag 17 is set, the HP-41 doesn't include an end-of-line indicator at the end of Data Byte sequences. However, some functions *always* include an end-of-line indicator, regardless of the status of flag 17.

Sending Escape Sequences

Escape sequences can be sent to the video interface (as the primary device) from the HP-41 keyboard using [ACCHR] (in Auto mode), as shown in the following example:

Keystrokes

27 [ACCHR]	The character code for Ec is sent to the interface.
69 [ACCHR]	The character code for "E" is sent to the interface. A Clear Device (Ec E) instruction is completed.

A Cursor to Address instruction may be similarly executed. After keying in the codes for Ec and %, two inputs are required to specify the column (0 through 31) and row (0 through 15) that the cursor should go to. Any number up to 127 may be used to specify row and column locations; however, 10 and 13 should not be used—they are redefined when sent in an Ec % instruction.

The following example shows how to instruct the interface to move the cursor to column 12, row 8.

Keystrokes

27 [ACCHR]	Sends the Ec character code to the video interface.
37 [ACCHR]	Sends the % character code to the interface.
12 [ACCHR]	Sends the column number to the interface.
8 [ACCHR]	Sends the row number to the interface. "Ec %" is now executed. The cursor is positioned at column 12 and row 8 of the video display.

Escape sequences can be combined with displayable characters in ALPHA data strings, then sent using [OUTA], [PRA] or [ACA]. The strings are created by specially building the escape character in the X-register with [BLDSPEC], recalling it to the ALPHA register, keying in the remainder of the sequence in ALPHA mode, then keying in words to be displayed, as shown in the following example:

Keystrokes

27 [BLDSPEC]	Builds the Ec character (HP-41 display is unintelligible).
[ALPHA] [ARCL] [·] X	Recalls the Ec character into the ALPHA register.
% CDTOP	The sequence is completed and the word TOP is
[ALPHA]	added. The character codes for C and D are used to determine the cursor address.
[OUTA]	The cursor is set at column 3, row 4 and the word TOP is written.

This example shows how standard HP-41 characters are used to specify the cursor address. Any character (except 10 and 13) can be used. For your convenience, some easily keyable address codes are shown in the following table.

COLUMN NUMBER	ROW NUMBER	CHARACTER	COLUMN NUMBER	ROW NUMBER	CHARACTER
0	0	(SPACE)	16	0	P
1	1	A	17	1	Q
2	2	B	18	2	R
3	3	C	19	3	S
4	4	D	20	4	T
5	5	E	21	5	U
6	6	F	22	6	V
7	7	G	23	7	W
8	8	H	24	8	X
9	9	I	25	9	Y
10	10	J	26	10	Z
11	11	K	27	11	;
12	12	L	28	12	<
13	13	M	29	13	=
14	14	N	30	14	>
15	15	O	31	15	?

Displaying Inverse-Video Characters

Inverse-video characters can be easily created using [BLDSPEC]. You can build a special inverse character by executing [BLDSPEC] with a character code in the X-register, recalling the character into the ALPHA register, then displaying it using [OUTA].*

The following example shows how to build and display the word "LOG" with inverse-video characters.

Keystrokes

[ALPHA] [■] [CLA] [ALPHA]	Clears the ALPHA register.
1 [BLDSPEC]	Sets the most significant bit to 1.
76 [BLDSPEC]	Specifies the character code for "L". The special inverse "L" character is now in the X-register.
[ALPHA] [■] [ARCL] [·] X [ALPHA]	Appends the inverse "L" to the ALPHA register.
[CLx]	Clears X-register before creating a new character.
1 [BLDSPEC]	Sets the most significant bit for the next character to 1.
79 [BLDSPEC]	Specifies the character code for "O". The special inverse "O" character is now in the X-register.
[ALPHA] [■] [ARCL] [·] X [ALPHA]	Appends the "O" to the first inverse character the ALPHA register.
[CLx]	Clears the X-register.
1 [BLDSPEC]	Sets the most significant bit for the next character to 1.
71 [BLDSPEC]	Specifies the character code for "G". The special inverse "G" character is now in the X-register.
[ALPHA] [■] [ARCL] [·] X [ALPHA]	Appends the "G" to the first two characters in the ALPHA register.
[OUTA]	Sends the word to the video interface.

After executing [OUTA], the word will appear as LOG on the video display.

*Inverse characters can be sent to the interface with [OUTA] only— [ACA] and [PRA] display characters normally.

Flags and the Video Interface

Several flags that affect how the HP-41 sends information to printer type devices—such as the video interface—are described in the *HP 82160A HP-IL Module Owner's Manual.* However, the calculator responds differently to flags 12 and 13 when sending information to the video interface. When either or both of these flags are set, a space is inserted in front of data that is sent to the interface (except by [OUTA]). Double-wide and lowercase modes are not available on the video interface.*

* However, lowercase letters can be sent to the interface using [ACCHR] with the appropriate character code in the X-register.

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Owner's Manual

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